Instructions: Complete each of the following exercises for practice.

1. Describe and sketch the surface in $\mathbb{R}^3$ defined by each equation below.

   (a) $x^2 + z^2 = 1$
   (b) $4x^2 + y^2 = 4$
   (c) $z = 1 - y^2$
   (d) $y = z^2$
   (e) $xy = 1$
   (f) $z = \sin(y)$

2. Use traces (i.e. cross sections) to sketch and identify the surfaces below.

   (a) $x = y^2 + 4z^2$
   (b) $x^2 = 4y^2 + z^2$
   (c) $3x^2 - y^2 + 3z^2 = 0$
   (d) $4x^2 + 9y^2 + 9z^2 = 36$
   (e) $z^2 - 4x^2 - y^2 = 4$
   (f) $9y^2 + 4z^2 = x^2 + 36$
   (g) $3x^2 + y + 3z^2 = 0$
   (h) $\frac{1}{9}x^2 + \frac{1}{25}y^2 + \frac{1}{4}z^2 = 1$
   (i) $y = z^2 - x^2$
   (j) $x = y^2 - z^2$

3. Reduce $x^2 + y^2 - 2x - 6y - z + 10 = 0$ to standard form, classify the surface, and sketch.

4. Sketch the region bounded by $z = \sqrt{x^2 + y^2}$ and $x^2 + y^2 = 1$ for $1 \leq z \leq 2$.